NASA's Deep Space Network: An Instrument for Scientific Research

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Abstract

This paper reports highlights of recent scientific, research using NASA's Deep Space Network (DSN) as a science instrument for research in Radio Astronomy, Solar System Radar Astronomy and Radio Science in direct pursuit of NASA's mission "to advance scientific knowledge and understanding of the Earth, the Solar System, and the Universe". Updates of the research program include summary results from recent experiments, descriptions of new instrumentation for the science programs, and plans for future experiments.

Examples of the current research program include studies of the early collapse phase of protostar formation using molecular spectroscopy; radar images of near-cal th asteroids (NEAs) and Earth-crossing asteroids; VLBI measurements of the expansion of supernova 1993J; measurements of the synchrotron emission from Jupiter's magnetosphere before, during and after the impact of the cored Shoemaker-Levy 9; and studies of Jupiter's atmosphere and the gravity field of Io using the downlink communicant ion signal from the Galileo spacecraft.

The objectives of the DSN Science Program are: (I) to design, build and operate science instruments that take advantage of the unique capabilities of the DSN for scientific, measurements; (2) to support current and future space missions via ground-based science exeriments;(3) to develop and test new techniques and procedures that will enhance the quality of the science data; and (4) to exploit the synergism derived from using the DSN as a precision science instrument and improving the DSN capability as a deep space communication instrument. Plans to meet these objectives are described in the paper.